

OLIN
QE
697
.U613
1902

...
...
Lansing, Lansing, and
Falls, Minnesota.

WITH EMPERIAL ... by
Prof. M. H. ...
and
NOTES ON THE LANSING ...
TON, BY Prof. ...

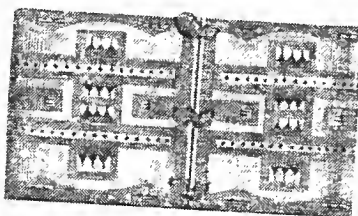
From: the American Geologist,
v. 30. September, 1902.

Olin
QE
697
U613
1902

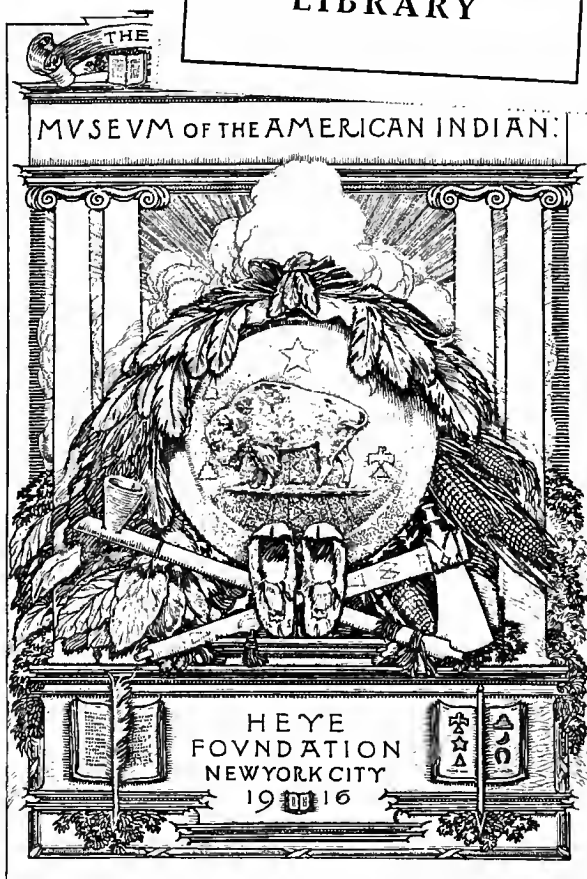
Kansas -

HUNTINGTON FREE LIBRARY

*Native American
Collection*



CORNELL UNIVERSITY
LIBRARY



MARSHALL H. SAVILLE COLLECTION

0 195 400 410 0

3 1924 097 761 278

DATE DUE

AUG			
2005			
GAYLORD			PRINTED IN U.S.A.

GAYLORD

PRINTED IN U.S.A.

Prof. Marshall L. Saville,
with compliments of Warren Upham.

MAN IN THE ICE AGE AT LANSING, KANSAS, AND
LITTLE FALLS, MINNESOTA.

BY WARREN UPHAM, ST. PAUL, MINN.

WITH EDITORIAL COMMENT,

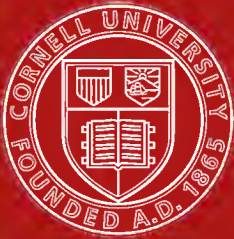
BY PROF. N. H. WINCHELL,

—AND—

NOTES ON THE LANSING SKELETON,

BY PROF. S. W. WILLISTON.

From the American Geologist, September, 1902.



Cornell University Library

The original of this book is in
the Cornell University Library.

There are no known copyright restrictions in
the United States on the use of the text.

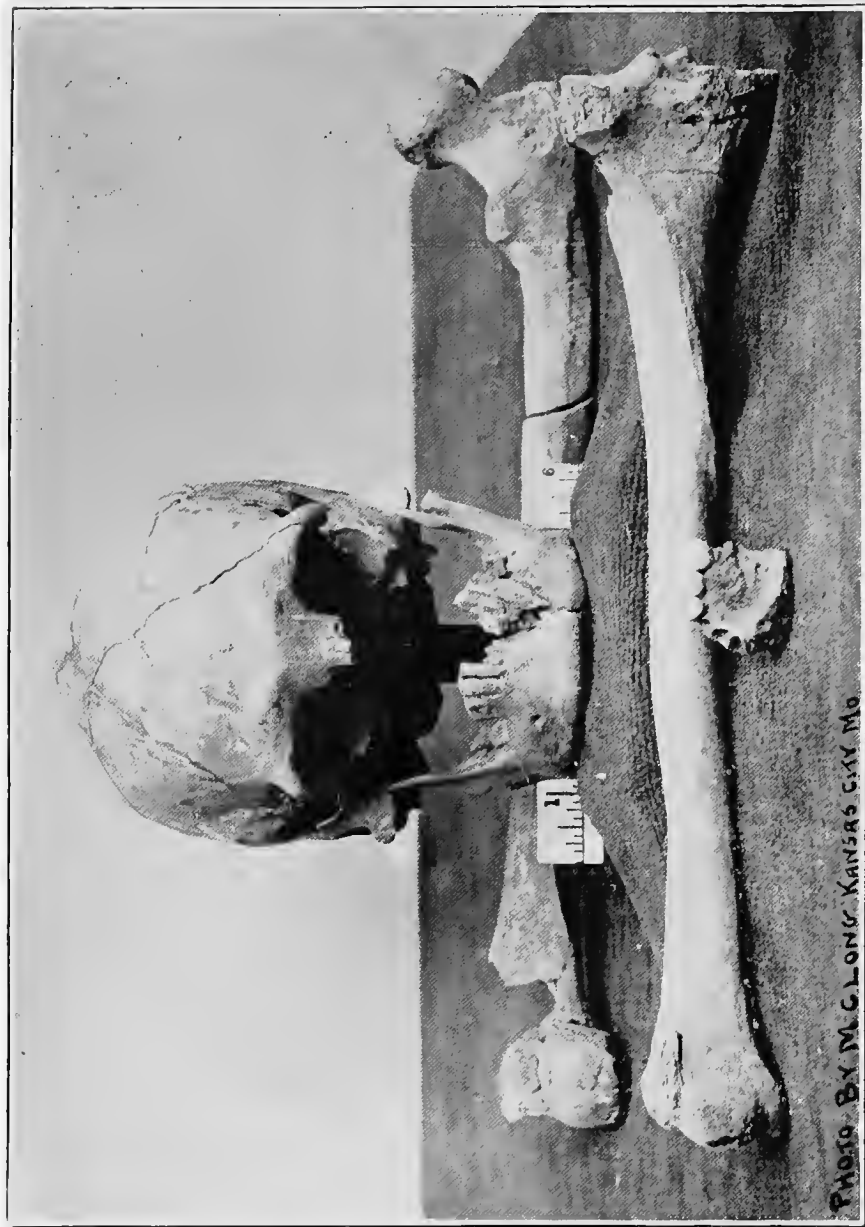
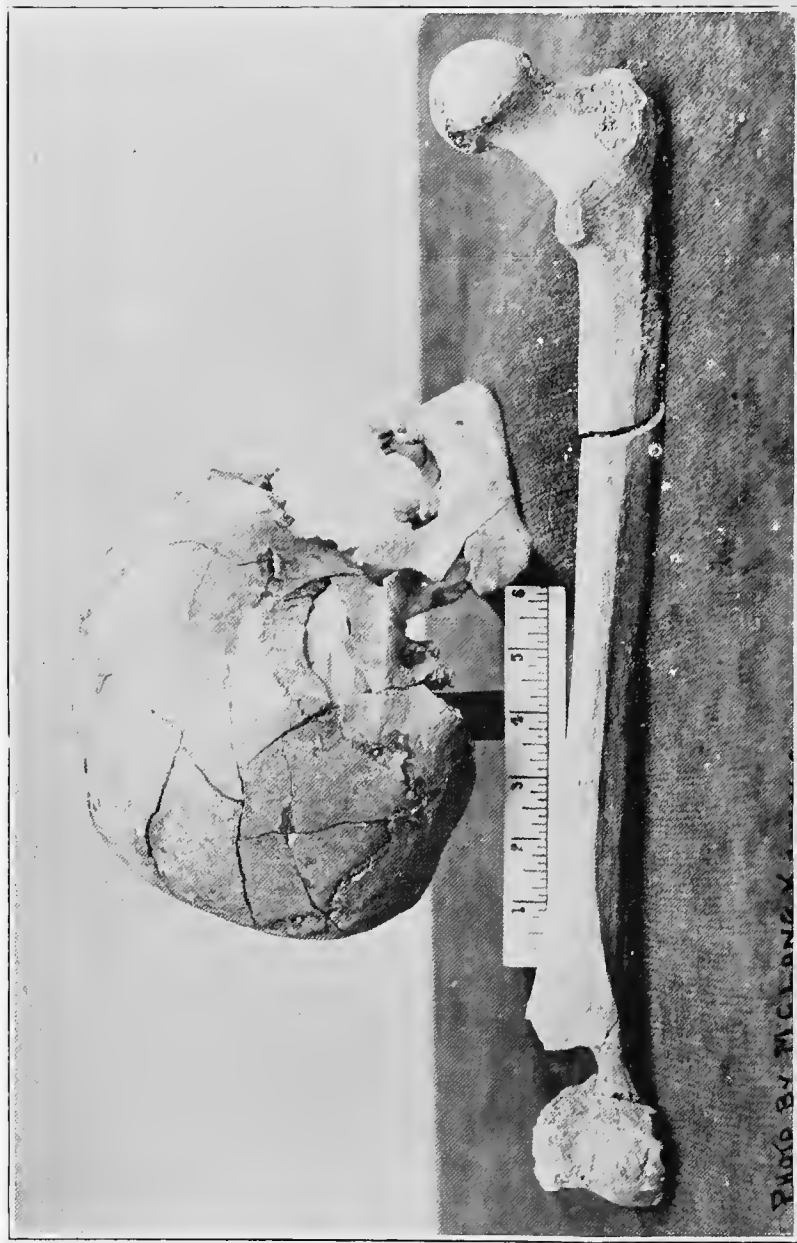


PHOTO BY MCCLONG KANSAS CITY MO

FRONT VIEW OF THE LANSING SKULL, WITH THE THIGH BONES.



PROFILE OF THE LANSING SKULL.

[From the *American Geologist*, Vol. XXX, September, 1902.]

MAN IN THE ICE AGE AT LANSING, KANSAS; AND LITTLE FALLS, MINNESOTA.

By WARREN UPHAM, St. Paul, Minn.

PLATES II AND III.

In a short article, entitled "A Fossil Man from Kansas," published in *Science* for August 1 (pages 195-196), Prof. S. W. Williston, of the Kansas State University, gave an account of his examination of a human skeleton and the locality, near Lansing, Kan., where it was discovered, about six months ago, under 20 feet of the Missouri valley drift. Through the kindness of Hon. J. V. Brower, an earlier newspaper account of this discovery had brought information of it to Prof. N. H. Winchell of Minneapolis, and to myself, which had led us to plan a visit to the Lansing locality for the purpose of studying the drift there in its relation to the recognized time divisions of the Ice age. Our visit was made on Saturday, August 9. In response to correspondence, we had the great advantage to be accompanied by Prof. Williston and Prof. Erasmus Haworth, of the State University, Lawrence, Kan., and M. C. Long, P. A. Sutermeister, and Sidney J. Hare, of Kansas City, Mo.

The skeleton was discovered February 20, 1902, in excavating a tunnel for storing fruit, vegetables, milk, butter, etc., in (and near the middle of the south edge of) the N. W. $\frac{1}{4}$ of sec. 28, T. 9 S., R. 23 E., close southwest of the Missouri river and of the narrow bottomland that skirts it there on the southwest side; being on the farm of Martin Concannon and only a few rods from his house, at the distance of about two and a half miles southeast from Lansing and about eighteen

miles northwest from Kansas City. His sons, Michael T. and Joseph F. Concannon, found the skull and most of the bones in their digging near the end of the tunnel, 69 to 71 feet from its entrance, 2 to 6 feet from its east side, and $1\frac{1}{2}$ to 2 feet above its floor. The bones were disjointed, and were partly broken, decayed, and irregularly strown about; but mainly they were huddled together in one place. The ribs and vertebræ were mostly decayed, so that they could not be preserved. Half of the broken lower jaw had been previously discovered, ten feet nearer the entrance and about one foot lower, that is, only a foot above the floor of the tunnel; and near that spot a phalangeal bone was found embedded in the wall of the tunnel by one of our party. The other half of the lower jaw, matching that found before, was with the chief parts of the skeleton. No bones besides these of a single human skeleton were found in the entire excavation of the tunnel; nor were any implements, artificially chipped stone flakes, or other articles of human workmanship discovered. The illustrations in Plates II and III are kindly contributed by Mr. M. C. Long, to accompany this paper.

Mr. Concannon and his sons supplied lights for our examination of the section displayed in the tunnel; and they kindly showed us where the bones were encountered, with detailed relation of the circumstances of their discovery. At first they had not suspected its scientific importance, and nearly a month passed before the first newspaper mention of it appeared in the *Kansas City Star*. Within a few days later the locality was examined by M. C. Long and Edwin Butts, of Kansas City, Mo., the former being curator of the City Public Museum, and the latter civil engineer of the Metropolitan Street Railway, by whom the skeleton was obtained with the design of placing it in that museum. The skull was found entire, but had afterward been accidentally broken into many pieces, which Mr. Long fitted together, depositing it in the museum; but the other bones, including both parts of the lower jaw, were at the time of our visit in the possession of Mr. Butts, at whose home they were examined by all our party. From where the skeleton was found, the overlying loess deposit has a thickness of 20 feet, as determined by Mr. Butts, to the surface of the ground above. Measurements of the tunnel were also

made by him, showing it to be 72 feet long, about 10 feet wide, and about $7\frac{1}{2}$ feet high. Its walls are vertical to the height of about six feet, above which the top is flatly arched, with no other support than is supplied by the well known coherent texture of the loess formation in which this upper part of the tunnel is dug. Resulting from their visit, a second article in the *Kansas City Star*, of March 23, written by Mr. Sutermeister, announced the provisional reference of the skeleton to a part of the Glacial period estimated as 35,000 years ago.

Upper Carboniferous limestone, determined from the abundant fossils collected by Mr. Hare in the region about Kansas City, outcrops at the site of the tunnel, and at much higher elevations close southeast, and somewhat farther away to the south, west, and northwest; but mainly it is covered and concealed by the extensive and very thick valley drift deposit of loess. The limestone, in a compact bed several feet thick, forms the floor of the tunnel, rising nearly two feet along its extent of 72 feet south-southeast into the bluff. Fragments of limestone and shale, with much earthy debris, rested on this floor along all the area of the tunnel, having a variable thickness of 2 to 4 feet, but mainly about $2\frac{1}{2}$ feet, and being thickest and most stony, as seen in the section, at the east wall of the tunnel. In the debris which thus formed the lower third of the excavation, fragments of the limestone, and of its associated thin shaly layers, are common up to 6 inches long, and several masses 1 to 3 feet long were encountered. One measuring 12 by 20 inches is imbedded in the head of the tunnel, only two or three feet from the site of the skeleton, and at a little greater height. The skeleton lay in the upper foot of the debris, or perhaps in a hollow of its surface; but the half of the lower jaw found separate, a foot lower, was certainly imbedded in the stony debris about a foot below its top where it is overlain by the loess. The Carboniferous limestone, from which its fragments in the debris appear to have been derived, outcrops within 50 feet southeast of Mr. Concanon's house, or only about 150 feet southeast of the tunnel, having there a height of 50 or 60 feet above the tunnel floor. Thence the rock outcrop gradually rises southeastward as a spur ridge, attaining within the distance of an eighth of a mile a height of fully 125 feet above the floor of the tunnel, or

about 150 feet above the ordinary level of the Missouri river; and the overlying loess rises onward to a height of 200 feet, or more, above the river, within another eighth of a mile, reaching there the general level of the top of the river bluffs and adjoining uplands.

According to the surveys of the Missouri River Commission, the extreme low and high stages of the river here during the period from 1873 to 1885 were respectively 735 and 760 feet above the sea level, the vertical range being 25 feet.* The extreme high water was in 1881, being the highest within the thirty-five years since Mr. Concannon settled here; but it was exceeded, probably six or seven feet, by the high water of 1844, of which a record was made at Kansas City. The skeleton was at a height of 11 to 12 feet above the high water of 1881, or 772 feet, nearly, above the sea; and the house is about 35 feet higher, with the limestone outcrop extending from near it up to about 900 feet above the sea, while the higher crests of the loess near by are at 950 feet, estimated approximately.

The coarse debris in the lower part of the tunnel contained, so far as we could observe, no glacial drift pebbles or stones of foreign origin, though they are frequent in the thin glacial drift which overlies the rock surfaces near. Many of these drift stones and boulders are of the red Sioux quartzite, which outcrops 300 to 350 miles northward, in southwestern Minnesota, the northwest corner of Iowa, and the southeast part of South Dakota. It occurs in this Kansan drift mostly in small fragments, but often one to two feet in diameter, and occasionally even measuring five feet, or more, and weighing several tons. The southern boundary of the glacial drift, marking the limit of the continental ice-sheet in its extreme extension during the Kansan stage of the Glacial period, is at a line passing from east to west, as mapped by Chamberlin and McGee, about 12 or 15 miles south of the Kansas (commonly called the Kaw) river, and 25 or 30 miles south of Lansing.†

Above the debris, which exhibits no marks of water assorting and deposition, the section, very clearly seen in each side

*U. S. Geol. Survey, Bulletin 72, 1891, p. 166.

†U. S. Geol. Survey, Seventh Annual Report, for 1885-86, pl. viii (map of the drift area and glacial striae of the United States.)

and at the end of the tunnel, consists for its upper two-thirds of the very fine siliceous and calcareous yellowish gray silt called loess, containing no rock fragments nor layers of gravel and sand, excepting a thin layer of fine gravel, with limestone and shale pebbles up to a half inch in diameter, which was noted by Mr. Butts near the roof of the tunnel, having a thickness of about four inches and an observed extent of some 30 feet. Soon after the skeleton was imbedded in the stony debris, or lay exposed on its surface, the geologic conditions that appear to have long prevailed were somewhat suddenly changed, and there ensued a more rapid deposition of the very fine water-laid loess, deeply enveloping the bones before they had time to be generally removed by decay under the influences of the weather and infiltrating air and water. From the horizon of the skeleton, the loess extends up to the surface, a vertical thickness of 20 feet, and continues in a gently rising slope to a slight terrace on which Mr. Concannon's house stands. With similar irregularly eroded slopes, the loess continues upward to the general elevation of about 200 feet above the river within a distance of a fourth of a mile to a half mile southward and westward, attaining there a general level which was probably the surface of the river's flood plain at the maximum stage of the loess deposition. This plain appears to have been built up by gradual deposition from the broad river floods during many years and centuries, and to have stretched then over the present valley and bottomland of the Missouri, in this vicinity two to four miles wide, from which area it has been since removed by the river erosion. The great valley, as to its inclosing rock outcrops, is of preglacial age; it was not much changed by glacial erosion and deposition of the boulder drift; but it was deeply filled by the loess, in which the valley was afterwards re-excavated.

Professor Williston noted a distinct darker layer of loess, mostly about two inches thick but in part merely a threadlike line, traceable continuously through all the 72 feet of the west wall of the tunnel, running about 3 to 4 feet above the limestone floor, and one foot or a little more above the base of the loess. Pegs driven by our party at the line of this stratum along all its extent were seen to be in a straight plane, which by a hand level was found to have a descent of 7 or 8 inches

from south to north in this distance. Other lines of almost horizontal stratification exist, but are less observable, throughout the loess, which is thus clearly shown to be an aqueous deposit. Several small gastropod shells were found in it by members of our party, but they were too delicate to be preserved for determination of their species. Three others, which have been carefully preserved by Mr. Butts, are said to have been found at the same place with the skeleton.

To ascertain the date of this fossil man in the sequence of the time divisions or stages of the Ice age, we must have recourse to the classification of these stages in their chronologic order as defined during the last ten years by the field observations and writings of Chamberlin, James Geikie, and other eminent glacialists, both of America and Europe. In the United States we owe more to the careful studies of glacial geologists in Iowa than in any other state, in respect to the series and probable duration of the stages recognizable in the Glacial period. Calvin, McGee, Call, Leverett, Bain, Udden, Shimek, and others, have worked very advantageously on the drift series in Iowa; and their work has been supplemented, for the later drift deposits farther north, by Chamberlin, Salisbury, Winchell, Todd, and the present writer, in Wisconsin, Minnesota, the Dakotas, and Manitoba, and by the late Dr. George M. Dawson and his associates in the Geological Survey of Canada. From these very thorough explorations and discussions of the history of the Ice age, we have received, chiefly through the systematic correlations of Chamberlin, Dawson, Calvin, and Leverett, an elaborate classification of its successive epochs and stages, which, for definite statement of the geologic date of the loess and the Lansing skeleton, need to be here briefly noted, as follows.

1. The culmination of the Ozarkian epeirogenic uplift, in the later part of the Lafayette period, the earliest of the Quaternary era, affecting both North America and Europe, raised the glaciated areas to so high altitudes that they received snow throughout the year and became deeply ice-enveloped. Submerged valleys and fjords show that this elevation was at least 1000 to 4000 feet above the present height. Rudely chipped stone implements and human bones in the plateau gravel of southern England, 90 feet and higher above the Thames, and

the similar traces of man in early Quaternary sand and gravel deposits of the Somme and other valleys in France, attest man's existence there before the maximum stages of the uplift and of the Ice age. The accumulation of the ice-sheets, due to snow-fall on their entire areas, was attended by fluctuations of their gradually extending boundaries, giving the Scanian and Norfolkian stages, named by Geikie, in Europe, the Albertan formation of very early glacial drift and accompanying gravels, described by Dawson, in Alberta and the Saskatchewan district of western Canada, and an early glacial advance, recession, and re-advance, in the region of the Moose and Albany rivers, southwest of Hudson bay. In that region, and westward on the Canadian plains to the Rocky mountains, there seem to have been thus three stages recognizable in the glacial results of the epeirogenic uplift, namely, the Albertan early ice accumulation, the later time represented by the Saskatchewan gravels, of abundant glacial melting and extensive retreat, and afterward a vast growth of the continental icefields to their farthest limit, when they reached south to Kansas. The first recognized stage of glaciation in North America is therefore called the *Albertan stage*.

On the Atlantic coastal plain of the United States, south of the glacial drift, this stage is probably represented by the Lafayette formation; and the subsequent deep fluvial erosion of the Lafayette beds I attribute to the very long ensuing Aftonian and Kansan stages.

2. A deposit of glacial drift, the lowest and oldest observed in the Mississippi river basin, probably of Albertan age, stretches south at least to southern Iowa, where it is overlain by interglacial beds, inclosing peat, well displayed in sections at Afton, Iowa. The Aftonian interglacial time, especially notable for its extensive buried forest bed, containing trunks of hardy northern coniferous trees, has been ascertained to be earlier than the Kansan readvance of glaciation. It is therefore probably equivalent with the Saskatchewan stage of Canada, which name it should then displace according to the rule of priority. This second time division of the Glacial period, including a very important recession of the ice border, uncovering the previously glaciated country as far north, probably, as

to the southern half of Minnesota, is therefore named the *Aftonian stage*.

During this time, apparently, the Mississippi river in the vicinity of Minneapolis eroded a rock channel which is now mostly filled by the drift of the later glaciation, but is marked by a series of lakes, namely, Cedar lake, the Lake of the Isles, lakes Calhoun and Harriet, and others farther south. Prof. N. H. Winchell from his study of this interglacial channel of the Mississippi, has estimated the duration of the interglacial stage there as about 15,000 years.* It seems to be represented also in the history of the Quaternary lakes Bonneville and La Hontan, respectively described by Gilbert and Russell, as a prolonged stage of desiccation of those lakes under a drier climate, while their earlier and later flood stages are correlated with the Albertan and Kansan stages of glaciation. Near the southern limit of the glacial drift, the Aftonian interval was doubtless much longer than in Minnesota.

3. During the *Kansan stage* the ice-sheet attained its farthest extent in the Missouri and Mississippi river basins, and in northern New Jersey. It is correlative with the Saxonian stage of maximum glaciation in Europe. The area of the North American ice-sheet, with its development on the Arctic archipelago, was about 4,000,000 square miles; and of the European ice-sheet, with its tracts now occupied by the White, Baltic, North, and Irish seas, about 2,000,000 square miles.

4. In the *Helvetian stage*, named by Geikie from its recognition in Switzerland and elsewhere in Europe, the ice-sheets receded far from their Saxonian and Kansan boundaries. The Buchanan gravels and sands, as named by Calvin in Iowa, were deposited during the retreat of the Kansan ice-fields; and this time is also represented by the Yarmouth weathered zone and erosion of the Kansan drift, noted by Leverett in Iowa and Illinois. The greater part of the drift area in Russia was permanently relinquished during this stage by the much diminished ice-sheet, which also retreated considerably on all sides.

5. The *Iowan stage* was marked by renewed accumulation of snow and ice, extending over a part of the country that had been laid bare by the preceding retreat. Before the farthest

**Am. Geologist*, vol. X, pp. 69-80, with map and sections, Aug., 1892; and p. 302, Nov., 1892.

extension of this glaciation in Iowa, on the west side of the Wisconsin driftless area, the ice-lobe east of that area advanced from Illinois into the edge of southeastern Iowa, giving an Illinoian stage of glaciation which somewhat antedated the maximum of the Iowan, though not probably by a wide difference of time. Between the retreat of the Illinoian ice-lobe and the deposition of the Iowan loess, Leverett notes interglacial deposits and a zone of weathering, the records of his Sangamon stage. Iowan time seems correlative with the Polandian stage of renewed growth of the European ice-sheet.

In this late part of the Glacial period the northern lands, which had long stood at greater altitudes than now, sank at last under their heavy ice-load until they mostly were somewhat below their present heights. This Champlain depression, as it is called, permitted the glacial drift of coastal regions to be covered by fossiliferous marine beds, which through later re-elevation range up to 300 feet above the sea in Maine, 560 feet at Montreal, 300 to 400 feet from south to north in the basin of lake Champlain, 300 to 500 feet southwest of Hudson and James bays, and similar or greater altitudes on the coasts of British Columbia, the British Isles, Germany, and Scandinavia.

Glacial melting and recession from the Iowan boundaries was rapid under the temperate (and in summers warm or hot) climate belonging to the more southern parts of the drift-bearing areas when reduced from their great preglacial elevation to their present height or lower. The finer portion of the drift, swept down from the icefields by the abundant waters of their melting and of rains, was spread on the lower lands and along valleys in front of the departing ice, as the loess of the Missouri, the Mississippi, and the Rhine. In or just beneath the basal beds of the Missouri loess was the Lansing fossil man, belonging thus to the culmination or beginning of decline of the Iowan stage of glaciation.

To this time the Columbian formation seems referable, succeeding the Lafayette and its erosion in our Atlantic coast region. In a Columbian gravel deposit, at Claymont, Del., probably of a little later date than the base of the loess at Lansing, Mr. Hilborne T. Cresson in 1887 found an argillite implement, as described and figured by Prof. G. F. Wright in his works cited on a following page.

6. Moderate re-elevation of the land took place during the *Wisconsin stage*, in the northern United States and Canada advancing as a permanent wave from south to north and north-east. The ice border continued mainly in a wavering retreat along most of its extent, but attained its maximum advance in southern New England. This last well defined stage of the Glacial period was characterized by slight fluctuations of the ice front and the formation of prominent marginal moraines. Great glacial lakes were held by the barrier of the waning ice-sheet on the northern borders of the United States. At the same time the Mecklenburgian stage in Europe was attended by the formation of conspicuous moraine accumulations at the gradually receding ice boundaries in Sweden, Denmark, Germany, and Finland.

It is clearly seen, from this review of the Ice age, that the Lansing skeleton and the deposition of the loess are referable to its later part, when the high land elevation that caused the growth of the vast sheets of snow and ice was succeeded by the Champlain depression, which brought the period of glaciation to its end. Man at Lansing was contemporaneous with the beginning of the tilling of the Missouri valley with the loess, probably a few thousand years before the very remarkable marginal moraines in Wisconsin, Iowa, Minnesota, and all our northern states, as well as in Canada, were formed on the boundaries of the departing ice-sheet. Most of the other observations of traces of men contemporaneous with glaciation in this country indicate merely an antiquity equal to that of the moraines formed during the glacial recession. Such are the discoveries of stone implements and the chips of their manufacture in the Late Glacial gravels of the Delaware valley at Trenton, N. J., in the similar valley deposits of Ohio, in the ancient floodplain of the Mississippi at Little Falls, Minn., in a beach ridge of the glacial Lake Agassiz in northwestern Manitoba, and the discovery of a fireplace under a beach ridge of the glacial Lake Iroquois in western New York, where geologists have found traces of man's presence during the closing scenes of the Ice age. For a comprehensive review of these traces of Glacial man, the reader may be referred to Wright's "*Ice Age in North America*" (1889), and his "*Man and the Glacial Period*" (1892).

Even these Late Glacial indications of man's existence in America, however, have been doubted in recent years by some of our ablest geologists and archæologists, for which reason Prof. W. H. Holmes, of the U. S. National Museum, has given much attention to this subject, visiting many of the reputed localities of evidences of man contemporaneous with the Ice age. His excavations and discussion of the locality of abundant artificially flaked quartz chips at Little Falls, Minn., led him to the conclusion that they were the work of modern Indians. But within the past year this place has been again very carefully studied by Brower and Winchell, with new excavations, leading them to refer the quartz chips to the later part of the Wisconsin stage of the Glacial period, while the waning ice-sheet yet covered the ground of the headwaters of the Mississippi.* To this view I have continuously given my support from the time when these quartzes were first brought to my attention by the paper concerning them presented by Miss Franc E. Babbitt at the meeting of the American Association in Minneapolis in 1883.

We owe to Prof. Winchell the first discovery twenty-five years ago, of artificial quartz chips at Little Falls referable to the Glacial period, his observations there in 1877 being published in the Sixth Annual Report of the Geological Survey of Minnesota. This was only one or two years after the earliest discoveries of stone implements in the glacial gravels of Trenton.

Brower gives to his work the title "*Kakabikansing*," which is the Ojibway word meaning Little Falls. His investigations, supplemented by aid of Prof. Winchell, seem to me to leave no room for doubt that men there, on the upper Mississippi river in central Minnesota, were contemporaneous with the accumulation of the great Leaf Hills moraine and with the glacial Lake Agassiz.

In the appendix of this volume I contributed a short paper, entitled "*Primitive Man in the Ice Age*," from which I may here quote two paragraphs to give my view of the probable

**Memoirs of Explorations in the Basin of the Mississippi: Volume V. Kakabikansing*, by J. V. BROWER, President of the Quivira Historical Society, with a Contributed Section by N. H. WINCHELL, President of the Geological Society of America, Councilors of the Minnesota Historical Society. Page 126; with many maps, and photographic illustrations of the quartz chips and implements. St. Paul, Minn., 1902.

time and conditions of man's first coming to America, as follows:

The first people in America appear to have migrated to our continent from northern Asia during the early Quaternary time of general uplift of northern regions which immediately preceded the Ice age, being its principal cause, and which continued through the early and probably the greater part of that age. Then, land undoubtedly extended across the present area of the shallow Bering sea. It is not improbable, too, that another line of very ancient immigration, coming by a similar early Quaternary land communication where now are wide tracts of the sea, passed from western Europe by the way of the Faroe islands, Iceland, and Greenland, to this continent. The very distant and dim antiquity of these migrations, however, will perhaps always forbid our looking back with clear and certain view, to trace their relative importance and their respective contributions to prehistoric American industries, traffic, customs, myths, and racial characters.....

An objection against migrations of primitive man to this western hemisphere during the Glacial period may be based on the ice-covered condition of North America at that time, wholly enveloped by an ice-sheet upon its northern half, northward from the Ohio and Mississippi rivers, excepting the greater part of Alaska. If the preglacial and early Glacial altitude of the continent had been the same as now, this objection would be valid, and we should be obliged to refer these ancient migrations wholly to a time before the accumulation of the North American ice-sheet, which reached both east and west beyond the present coast lines. But the land elevation then, as known by old river valleys submerged beneath the sea and by marine shells of littora and shallow water species dredged at great depths, was 3,000 to 8,000 feet greater than now. During the epoch of ice accumulation and culmination, its boundaries probably failed to reach generally to the coast line of that time. Along the sea border, where food supplies such as savages rely upon are most easily obtained, preglacial and Glacial man may have freely advanced on a land margin skirting the inland ice, as along the present borders of Greenland. It was only in the Champlain epoch, closing the Glacial period, that the ice-burdened lands sank to their present altitude or lower, bringing the edges of the ice-sheet beneath the encroaching sea.

Winchell and others have computed or estimated the duration of the Postglacial period as 7,000 to 10,000 years, basing their estimates on the rates of recession of waterfalls, of weathering and dissolving of exposed surfaces of limestone, of wave erosion and beach gravel accumulation by lakes, and of sedimentation by lakes and streams. This measure, supplied by many independent observers in America and Europe,

may be confidently accepted as the approximate duration of Postglacial time. For the antiquity of man at Trenton and at Little Falls, it may be stated as about 7,000 years. If we should adopt the ratio given by Chamberlin, who estimates the Iowan stage as five times as long ago,* it would give the antiquity of the Lansing fossil man as about 35,000 years, agreeing with the first newspaper estimate before mentioned.

My studies of the glacial Lake Agassiz, however, warrant no longer time for its duration than 1,000 years.† On a similar scale, I think the time of glacial recession from the Iowan stage to the north end of Lake Agassiz may be no more than 5,000 years, giving a date about 12,000 years ago for the Lansing man and the loess. Further back, I may also give my estimates of the earlier parts of the Glacial period, as about 10,000 years for the growth of the icefields during the Iowan stage, before the Champlain subsidence caused them to melt and supply the loess in its chief abundance; about 10,000 years for the preceding Helvetian or Buchanan glacial retreat, giving thus some 25,000 years before the end of the Ice age as the time of the Kansan maximum glaciation; a previous slow ice accumulation and transportation of the Kansan glacial drift, that is, the Kansan stage of the Ice age, also about 25,000 years; the previous Aftonian stage of glacial recession, another such allowance of about 25,000 years; and, earliest of all, the Albertan stage of ice accumulation and formation of its drift deposits, likewise about 25,000 years. All the Ice age I would thus comprise within about 100,000 years. This estimate seems to harmonize well with the geologic time ratios of Dana, Walcott, and others, which indicate about a hundred million years as the duration of life on our globe.

Man in the Somme valley and other parts of France, and in southern England, made good palæolithic implements fully 100,000 years ago, according to my estimate of the length of the Ice age.§ When the earliest men came to America cannot probably be closely determined. It was during the Glacial period, or possibly earlier. The Lansing skeleton affords probably our oldest proof of man's presence on this continent; but it is

**Journal of Geology*, vol. iv, pp. 872-876, Oct.-Nov., 1896.

†*U. S. Geol. Survey. Monograph* xxv, 1895, pp. 200, 210, 225, 238-244.

‡*Am. Geologist*, vol. xxii, pp. 350-362, Dec., 1898.

only a third, or, as I think more probably, only about an eighth, so old as the flint hatchets of St. Acheul and other localities of the old world.

It will be objected, to my estimate of the antiquity of the Lansing man, that the subærial erosion, weathering, and various other features of the Kansan, Illinoian, Iowan, and Wisconsin drift deposits, with the associated interglacial beds, necessitate a much greater duration of these stages of the Glacial period than I have here suggested. Instead, I would reply that the old till sheets and the loess are spread somewhat evenly on the preglacial rock surface, all the valleys and grand topographic forms of the country in the southern part of our drift area being of preglacial origin. The drift earliest eroded from the preglacial land was also largely the residuary clays and decaying rock of the surface, accounting for the great contrast in composition of the more southern and the more northern drift deposits, even when of the same mode of formation and the same age.

Concerning the deposition of the loess along the Missouri river and on the older drift to long distances at each side, I think that its derivation chiefly from the englacial and finally superglacial drift is clearly demonstrable. Swept by the summer floods from the melting ice-surface, it was laid down as a deep valley drift deposit, thickening and lifting the great river on the vast floodplain until it flowed, during the hot part of each year, in a lakelike sheet of water, probably from 5 or 10 to 30 or 40 feet deep and far wider than the present bottomlands, at the general height of the loess bluffs and uplands. During the cool but not wintry parts of the year, in the spring and autumn, when the floods were reduced to comparatively small channels, or sometimes throughout several years together having less plentiful melting of the ice-sheet, land vegetation and air-breathing mollusks could occupy the newly deposited loess tracts. But the scantiness of vegetation on areas subject to summer overflow permitted the winds to carry off much of this very fine loess and to spread it over the contiguous country in massive swells and ridges, conforming in a general way to the previous contour. With decrease in the supply of both water and loess, when the Iowan ice-melting was nearly finished, the rivers eroded deep and wide valleys in their loess plains, the valley of the Missouri

ranging from three to fifteen miles in width, and attaining a depth below its present bottomlands.

During the Wisconsin moraine-forming stage the land was re-elevated to about its present height. The Missouri and its tributary streams, laden with gravel, sand, and fine silt, supplied plentifully from the melting ice in this stage, built up again their floodplains to heights slightly above the present river bottoms. Between Sioux City and Council Bluffs, Iowa, a distance of 90 miles, this alluvial plain of the Wisconsin modified drift is mainly 6 to 12 miles wide on the east side of the river, a most fertile tract for corn-raising.

The Lansing discovery gives us much definite knowledge of a Glacial man, dolichocephalic, low-browed, and prognathous, having nearly the same stature as our people today. As stated by Prof. Williston, he was doubtless contemporary with the *Equus* fauna, well represented in the Late Pleistocene deposits of Kansas, which includes extinct species of the horse, bison, mammoth and mastodon, megalonyx, moose, camels, llamas, and peccaries. He was also the contemporary of the Late Paleolithic men of Europe, who in the Solutrian and Magdalenian development of implement-making from flint and bone, and in various other manifestations of artistic skill, were far advanced beyond primitive savagery.

It may be reasonably expected that many other evidences of the men of the loess-forming stage of the Ice age will be found, and will give some knowledge or hints of their mode of life. Two such items of testimony are already known in Iowa. Prof. F. M. Witter, superintendent of schools at Muscatine, in a paper read before the Iowa Academy of Sciences in 1891, described "a rather rudely formed spear point of pinkish chert," found in the loess in that city about 12 feet from the surface, and an arrow point in the same loess section, "at least 25 feet below the surface." Both were discovered in place by Mr. Charles Freeman, the proprietor of a brickyard. Again, in volume XI. of the Iowa Geological Survey, published last year, Prof. J. A. Udden, reporting on Pottawattamie county, writes: "In tunnelling the cellars into the loess hills back of Conrad Geisse's old brewery, on Upper Broadway in the same city [Council Bluffs], it is claimed that a grooved stone ax was taken out from under thirty feet of loess and forty

feet from the entrance of the cellar excavation. The ax has an adhering incrustation of calcareous material on one side, evidently deposited by ground water. The loess at this place has possibly been disturbed by creeping or by rain wash, but its appearance suggests nothing of the kind. It is quite typical loess for this region. The ax was discovered by the workmen engaged in excavating the cellar and immediately shown to Engineer Robert F. Rain, who superintended the work, and who still has possession of it."

Since man is shown to have lived in this region, probably 10,000 to 15,000 years ago, with elephants and mastodons, it seems quite possible that he left some token of them in the forms of some of his mounds, or in their contents, as the much discussed sandstone pipes found in Louisa county, southeastern Iowa, and owned by the Davenport Academy of Natural Sciences, carved to represent the elephant or mammoth of the Ice age. In Europe, at about the same time, the spirited carvings of the outlines of mammoths and reindeer, on their own tusks and antlers, by the Late Paleolithic men, give indubitable evidence that they and these animals of the Glacial period subsisted together. Indeed, very probably the extinction of the mammoth, and of the horse in America before Columbus came, may have been due to the prowess of the aboriginal hunters in killing them for their food.

[*From the American Geologist, Vol. XXX, September, 1902.*]

EDITORIAL COMMENT.

THE LANSING SKELETON.

The article of Mr. Upham in this number of the *GEOLOGIST* sufficiently details the facts relating to the topography and other surroundings of the place in which this skeleton was found. It may be well to mention however, more in detail, some facts relating to the skeleton itself, and to the act of discovery.

The tunnel in the excavation of which the skeleton was found was commenced in the winter of 1900 and 1901, and was about half completed that winter. It was resumed and completed in the winter of 1901-1902. The human skeleton was found in February, 1902, at the distance of about 70 feet from the mouth of the tunnel and about 20 feet below the natural surface.

The men are farmers and did not appreciate the significance of the discovery, breaking the skull with the pick and scattering the pieces with the rest of the skeleton, hardly taking pains to throw the fragments into a place by themselves. Mr. M. C. Long and Mr. Butts, both of Kansas City, endeavored to secure the remains, and Mr. Butts purchased from the owner for a dollar and a half, the right to the lot, but a compromise was effected by which Mr. Long received the fragments of the skull and Mr. Butts received the rest. Mr. Long was instrumental in bringing the skeleton to public notice and Prof. Williston's article in *Science*, Aug. 1, 1902, was the first accurate and trustworthy account. It is plain, therefore, that the circumstances of the initial history do not suggest any collusion or attempt to deceive the public.

The owners of the farm were subjected to close questioning. It should be stated that after the close of the examination of the spot, in the presence of the owners, there rested on the minds of the four experienced scientists present and participating not a shadow of doubt as to the veracity of the farmers Concannon. Some of the party (including the writer) inspecting the wall of the tunnel with a small pick, about sixty feet from the entrance, for the purpose of learning its character and alternations, found small bits of black charcoal near the top and two small fragments of bone adherent in the wall,

near the floor of the tunnel. Others found fragments, by pulling over the dump heap at the mouth of the tunnel.

The material penetrated by the tunnel is common loess, but throughout its lowest, 2 to 4 feet; it is very irregular. It here shows no evidence of water stratification. It is charged with rotting fragments and slabs of the limestone of the region, but contains no foreign drift. Over this mass of non-stratified material is a thickness of two or three feet of distinctly stratified loess. The evidences of water stratification become less and less distinct toward the roof of the tunnel, but there is no abrupt change in texture from the bottom of the stratified portion to the roof of the tunnel. It appears reasonable to suppose that at first the entire mass of loess was stratified, and that by the action of atmospheric forces, including vegetation, the stratified structure has been destroyed in the upper portion. It was probably deposited by the Missouri river at a former high stage and cannot be distinguished from the great loess sheet of that valley at Kansas City. The skeleton was found, not in this alluvial loess deposit, but in the unstratified debris amongst the limestone fragments that lie below it. It is hence pre-loessian but probably not much older than the loess, since, if it had been long exposed near the natural surface prior to being covered by the loess, the skeleton would probably have been so disintegrated that the bones would not bear their own weight. The material in which the skeleton lay was apparently the sliding and rotting limestone debris that accumulates on all limestone bluffs, and which is seen along the river bluffs at the present time where the railroad skirts them and the grade occasionally cuts into them.

Professor Williston has kindly furnished the following memorandum of the skeleton:

The preserved portions include the larger part of the skeleton:—the skull, various vertebrae, humeri, radius, carpal and finger bones, pelvic bones, femora, tibiae, fibulae, tarsal and toe bones. The femora measure seventeen and a half inches in length, indicating a person of average size. The pelvic bones have not been mended so that the sex can be determined. The skull does not appear to be much if any below the average size; it is distinctly dolichocephalic, the forehead receding, with the orbital margins prominent, and showing especially prominent supraciliary ridges. The complete mandible has lost on each side the first and second molars, with absorption of the alveolar processes. All the other teeth are worn to a remarkable degree, the third molars or

wisdom teeth are large with the crowns worn more than half way down, smoothly and with the surface inwardly oblique. The incisors, canine and premolars also show the same extreme wear with the inner, or buccal surface worn away deeply. Three teeth and three alveolæ are preserved in the maxillary bone, all the teeth much worn except the second molar which was above the diastema left by the loss of the molars below. This tooth shows little or no trace of wear, indicating the loss of the lower molars at a time long prior to the death of the individual. There is no indication of the ridges above the genial tubercles on the inner side of the mandible in front, said to be characteristic of the *Homo neanderthalensis*. The cranium has a remarkable resemblance to one of a mound-builder recovered from a mound near Kansas City some years ago. The two halves of the mandible appear to have been broken in two either at the time of death or afterwards, as they were found separated, if the testimony of the finders is to be relied upon; their extremities also indicate an original separation of the parts by the hard matrix attached to them.

Prof. Williston also writes, Aug. 26: From a recent examination of the Lansing bones I find that they belong to a female between five feet two inches and five feet four inches in height. They are unusually small, even for a female; the forearm is unusually long; the pelvis not very broad. The woman was not less than forty years of age.

Again Prof. Williston writes, August 31, 1902: A further and careful examination of the bones of the "Lansing skeleton" proves conclusively that there are two skeletons. The jaw found at a distance (as I understand) is that of a child about 10 or 11 years of age, as is shown by the presence of uncut canine tooth and of a deciduous molar. Please, therefore, correct my statement previously sent that the upper first molar showed little wear,—thus indicating the removal of the lower molars at a much earlier time. This jaw (the upper) belongs to the child.

It was noticeable that there is some irregularity in the size of the teeth, viz.: the canine teeth are small, resembling incisors, and are followed, backward, by two similar incisor-like teeth in place of distinct bicuspid.

The important question lies in the age of the loess covering the skeleton—was it of the high-water stage of the Wisconsin epoch, or of the Iowan? There was not sufficient time at hand to enable the party to go into a thorough examination of the valley with a view to determining the question with certainty. There is not, in the immediate vicinity any sufficient evidence of the existence of terraces, whether of residuary or constructional origin, along that part of the great valley; but at Council Bluffs, in Iowa, north of the city, is a distinct rem-

nant of a terrace rising about 125 feet above the river, the contents of which are loess, but at the base becoming too sandy and coarse to warrant that name. Again, between Council Bluffs and Sioux City, as mentioned by Mr. Upham, another terrace about 20 feet above the river borders the river on the east side for many miles. The Missouri Valley Railroad is located on it. There is at hand no evidence as to the nature of this lower bench—whether it consists of drift materials or of rock, and if of the former whether it is a residuum of the general loess sheet due to a halting shrinkage of the Missouri from its loessian stage or to a constructural refilling subsequent to its deeper excavation. Mr. Upham regards it, at least in a tentative manner, as a constructural terrace of later date than the general loess, and probably due to the high waters of the Wisconsin ice-sheet then existing further north. In the absence of knowledge of the nature of these terraces, either or both of which may have once existed at Lansing and at the Concannon farm, the only recourse is to accept the determinations and classification of the Iowan geologists as to the origin and date of the loess covering the tomb of the Lansing man.

The general loess sheet of the Missouri valley, in western Iowa and in northwestern Missouri, and in the adjacent portions of Nebraska and Kansas, presents such uniformity of character that it seems necessary to ascribe it to a single cause and apparently to the same date. Still Prof. J. E. Todd has suggested that* it is divisible into two parts: an upper loess, covering the uplands, and a lower loess restricted to the valley of the river, the latter being much the younger and forming a terrace which rises about 125 to 150 feet above the present level of the river. Such terrace has already been mentioned at Council Bluffs. It is indicated on the Omaha side of the river, viewed from Council Bluffs, by the jog in the distinctness of the timber line. This terrace must have extended to Lansing and its relative date, as compared with the upland loess, plays an important part in the question of the age of the loess overlying the skeleton.

In any case, accepting the determinations of the geologists of Iowa, and the time-ratios of Prof. Chamberlin, the loess of the river at Lansing can be no more recent than the date of

* *Missouri Geological Survey*, vol. x, p. 128.

the Iowan ice-epoch, and that would make it five times the period elapsed since the final retirement of the ice. Post-glacial time has been computed in various ways, and it has been pretty nearly unanimously agreed that post-glacial time does not exceed 10,000 years, and probably amounts to about 8,000 years. Accepting the lower term, the age of the Lansing man is found to be near 40,000 years. These time-ratios, however, are tentative, as given by Chamberlin, and may require considerable modification.

From a study of the interglacial gorge running through the west part of the city of Minneapolis, the writer calculated that about 15,000 years were required for its excavation by the Mississippi river.* It was supposed to have been formed immediately prior to the Wisconsin epoch and after the Iowan. On that supposition the close of the Iowan epoch was approximately 23,000 years ago. If 8,000 years be added to this for the duration of the Iowan (which is probably too small an allowance) the commencement of that epoch, which may be assumed to be about coeval with the Lansing skeleton, was about 31,000 years ago. If, however, the interglacial Mississippi gorge at Minneapolis was excavated at some earlier interglacial epoch, say the Buchanan (pre-Iowan) or the Aftonian (as suggested by Mr. Upham) it antedates the Iowan loess, and cannot serve as a factor in any calculation as to the age of the Lansing skeleton.

It will require, therefore, considerable further and careful examination of the loess sheets of Iowa, and of their relations to the till-sheets, as well as the marginal features of the till-sheets themselves, to enable anyone to fix with any certainty the age of the Lansing skeleton more exactly than is above indicated. That it dates from glacial time, at some remote point in the complex history of that age, is about all that can be affirmed from the present state of knowledge of the drift deposits.

It remains to call attention to a newspaper story which affirms that formerly a cemetery of the Fort Leavenworth penitentiary was located at or near this place, and that the skeleton is but one of numerous others that could probably be found in the immediate vicinity if sufficient exploration should be under-

* An approximate interglacial chronometer, *AM. GEOL.*, vol. x, p. 69 and 302, 1892.

taken. It is not at all likely that the four geologists who made the recent joint examination, and who are supposed to be expert in the detection of all irregularities in the ground and all such variations that would be implied in the existence of a modern burial at this place, would have failed to observe the disturbance which such a burial would have produced. Again, on the authority of Mr. Long it appears that such former burial place was at a distance of three miles from the place at which this skeleton was found.

Still the same imputation can be brought against this skeleton as against numerous other alleged human relics discovered in glacial or pre-glacial deposits, viz.: no scientist was present at the time of discovery to vouch for the fact and to verify the place and the surroundings of the skeleton. N. H. W.

The American Geologist

Was begun January 1, 1888, and has been issued monthly since that date. It is not the organ of any institution, nor of any section of the country, nor of any party.

Its Editorial Board

Is made up of twelve active Geologists, whose places of residence are scattered from the Atlantic to the Pacific and from the Lakes to the Gulf. One is connected with the Canadian Geological Survey, three have been employes of the United States Geological Survey, two are State Geologists, four are employed on State Surveys, five are Professors in State Universities or other leading institutions of learning and all are active participants in the development of American Geology.

It Contains

Original articles by American Geologists and monthly reviews of current Geological literature. It gives personal and scientific news. It is cosmopolitan in its scientific scope and is open to the thoughtful and careful contributions of all Geologists.

**Subscription is \$3.50 per Year;
and \$4.00 to Foreign Countries.**

Sample Copies, twenty cents.

**Back numbers can be supplied at \$1.50 per volume. Two volumes yearly,
each of more than 400 pages.**

Address

THE GEOLOGICAL PUBLISHING COMPANY,

MINNEAPOLIS, MINN.

